

REMARKS

This amendment is in response to the Official Action mailed on February 9, 2006, and is being filed together with a Petition for Revival of an Application for Patent Abandoned Unintentionally under 37 C.F.R. § 1.137(b).

In the present paper, claim 25 is amended. Claims 1-15 were canceled in a previous paper. Claims 16-22 are withdrawn. Claims 23-27 are presented for the Examiner's consideration in view of the following remarks:

Objections to the Information Disclosure Statement

The Examiner has objected to the Information Disclosure Statement submitted on March 24, 2004 because copies of the foreign parent documents and non patent literature were not submitted. The listed documents were previously cited in the then-co-pending parent Application Number 09/568,464, now U.S. Patent 6,742,727, upon which the Applicant relies upon for priority. The earlier application was properly identified in the subject information disclosure statement. Applicant respectfully submits that, under 37 C.F.R. § 1.98(d), copies of the listed documents need not be resubmitted.

Objections to the Specification

The Examiner has objected to the specification as not providing support for the following limitation in claim 25:

such that a product of the first distance and first spacing is
generally equal to a product of the second distance and second
spacing .

Applicant notes that the marked up copy of the substitute specification filed on 03/24/2004 states that:

To maintain a generally constant area of fuel flow, the height between the metering orifice disc 50 and the tapered portion 350 of the valve seat 30 must decrease (as shown in the decreased height A4 as compared to height A3 in FIG. 2) according to the formula:

$$2\pi r_1 h_1 = 2\pi r_2 h_2 \quad \text{Equation 1}$$

where:

r_1 is a radius of the fuel flow between the longitudinal axis 270 and location A3;

h_1 is a height between the metering orifice disc 50 and the tapered portion 350 at location A3;

r_2 is a radius of the fuel flow between the longitudinal axis 270 and location A4; and

h_2 is a height between the metering orifice disc 50 and the tapered portion 350 at location A4.

Marked up copy of the Substitute Specification filed on 03/24/2004 at p. 8, line 25 – p. 9, line 9.

The “first distance” of claim 25 is claimed to be a from the longitudinal axis distance to the first position. That distance is exactly r_1 of Equation 1 of the specification, the radius from the axis to location A3. The “first spacing” of claim 25 is claimed to be a spacing of the first position along the longitudinal axis from the surface of the metering disc confronting the seat (parent claim 23). The “first spacing” is therefore exactly h_1 of the specification, defined as the height from the metering disc to the tapered portion 350 of the valve seat. Similarly, the “second distance” and “second spacing” of claim 25 are defined to be exactly to be r_2 and h_2 as defined in the specification.

As to the constant " 2π " appearing as a factor on both sides of equation 1 of the specification, Applicant asserts that the equation claimed in claim 25 is exactly equivalent to Equation 1 of the specification, because the constant factors on both sides of Equation 1 cancel, leaving the claimed equation.

Applicant therefore respectfully submits that all the elements of claim 25 are fully supported in the specification as filed.

Claim Rejections under 35 U.S.C. § 112

The Examiner has rejected claim 26 under 35 U.S.C. § 112, second paragraph. Specifically, the Examiner alleges that the limitation "comprises increasing the radial velocity between the seat orifice and each of the metering orifices" is indefinite as reciting a functional limitation. The Examiner argues:

It is unclear to the Examiner as to what 'comprises increasing the radial velocity . . .' as increasing the radial velocity is a desired result of the method and is not an actual part or tangible piece of the fuel injector.

Office Action of 02/09/06 at 3.

Applicant respectfully submits that, while "increasing the radial velocity" may not be an actual part or tangible piece of the fuel injector, the claim is not directed to a fuel injector, but is instead directed to a "method of controlling a spray of fuel flow." The claimed step of "increasing the radial velocity" is, in fact, an actual step in that method. It is not merely a desired result, as alleged by the Examiner, but is a step in the series of steps to be performed to achieve the result of controlling a spray of fuel flow. Applicant therefore submits that the step of

“increasing the radial velocity” meets the definiteness requirements of 35 U.S.C. § 112, second paragraph.

The Examiner has rejected claim 27 on similar grounds. Applicant submits that claim 27 meets the definiteness requirement of 35 U.S.C. § 112, second paragraph, for the same reasons outlined above for claim 26.

The Examiner has objected to claim 25 because “the a product” on line 7 should read “the product.” Applicant has amended claim 25 to correct that typographical error. Additionally, the term “frustoconical” has been deleted from claim 25 to correct an error.

Applicant therefore submits that all the claims in the case now meet the definiteness requirements of 35 U.S.C. § 112, second paragraph.

Claim Rejections under 35 U.S.C. § 102

Claims 23-27 stand rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by U.S. Patent No. 5,765,750 to Pace et al. (“Pace”). Applicant respectfully traverses those rejections.

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." M.P.E.P. § 2131 (quoting *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987)).

Pace describes a fuel injector including a flow straightener 28 and controlled disturbance element 30 separated from each other and from the valve seat 16 by spacers 32, 34 (col. 3, lines 1-53; FIG. 2). In another embodiment, a combined flow straightener and controlled disturbance element 40 is described (col. 3, lines 54-64; FIG. 4).

Applicant submits that Pace fails to disclose several elements claimed in independent claim 23, and for that reason, Applicant respectfully submits that claim 23 is patentable over that reference.

Claim 23 requires the method to be performed in a fuel injector with a
seat having a seat orifice and a first channel surface extending
obliquely to the longitudinal axis, the metering disc including a
second channel surface confronting the first channel surface so as
to provide a flow channel.

As best shown in FIG. 2 of the present application, the channel 560 is formed by the tapered (oblique) surface 350 of the seat and the surface 510 of the metering disc (*see* marked-up copy of the Substitute Specification filed on 03/24/2004 at 7, lines 21-23).

Pace does not disclose a first channel surface of the seat extending obliquely from the longitudinal axis, as required by claim 23. Instead, FIGS. 2 and 4 of Pace clearly show a surface of the seat that is perpendicular (not oblique) to the longitudinal axis.

Pace furthermore does not describe any flow channel defined by a surface of the seat confronting another surface, as required by claim 23. Instead, the surface of the seat 16 of Pace directly abuts the straightener 28 (FIG. 2) or the flow element 40 (FIG. 4). No flow channel is formed between those abutting surfaces.

Claim 23 further requires the step of
imparting a radial velocity to the fuel flowing from the seat orifice
through the flow channels so that fuel flows in a transverse
direction across and through the fuel metering orifices.

Nowhere in Pace is there disclosed imparting a radial velocity to the fuel. In fact, the injector of Pace employs a “fuel straightener” that “straightens fuel flow to provide an improved flow pattern, thereby providing a more targeted fuel spray” (Pace at col. 1, lines 27-29).

At least because Pace fails to teach or suggest the limitations of independent claim 23 discussed above, Applicant submits that claim 23 is patentable over that reference. Applicant further submits that claims 24-27, which depend directly or indirectly on claim 23, are also patentable at least because they incorporate those same limitations.

Applicant further asserts that claim 25 is patentable for the additional reason that it requires a particular geometry of the flow channel such that “a product of the first distance and first spacing is generally equal to a product of the second distance and second spacing.” That geometry provides a generally constant fuel flow area as fuel flows radially outward (marked up copy of the Substitute Specification filed on 03/24/2004 at p. 8, lines 20-28). No such geometry is disclosed by Pace.


Claims 26 requires that the radial velocity of the fuel be increased; claim 27 requires that the radial velocity be decreased. Applicant submits that those claims are patentable over Pace for the additional reason that Pace does not teach or suggest changing the radial velocity of the fuel.

Conclusion

Applicants therefore assert that claims 23-27 are in condition for allowance, and earnestly request that the Examiner issue a Notice of Allowance.

Should the Examiner have any questions regarding the present case, the Examiner should not hesitate in contacting the undersigned at the number provided below.

Respectfully,

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